

## **A Study of Clay and Soil Development as Affected by Drainage and Land Use Karoon River Surroundings**

**SIROOS JAFARI<sup>1\*</sup>, FARZANEH BANDEH ELAHI<sup>2</sup>, BIJAN KHALILIMOGHADAM<sup>3</sup>**

1. Associate professor, Dept. of Soil science, Ramin Agriculture and Natural Resources University of Khuzestan.

2. Former Graduate Student, Dept. of Soil Science, Ramin Agriculture and Natural Resources University of Khuzestan.

3. Assistant Professor, Dept. of Soil science, Ramin Agriculture and Natural Resources University of Khuzestan.

(Received: Dec. 14, 2015- Accepted: May. 25, 2015)

### **ABSTRACT**

The aim followed in the present study was a determination of soil and clay mineral diversity in alluvial soils along Karoon River. For this, 14 profiles were described on the transect perpendicular to some eastern direction of Karoon River bank. These profiles were 1 Kilometer apart and belonged to different drainage conditions and land use. The results indicate that soil salinity increased, while OM is being decreased with increasing distance from Karoon River bank. This was related to drainage class changes. Ochric epipedon was diagnostic in all pedons. The subsurface horizons were restricted to cambic and salic horizons. The cambic horizon was formed due to wetting and drying either under irrigation or rain, due to which crack and cleavages were formed in subsoils. Also, salic horizons were formed under high saline water table. Chlorite, illite, kaolinite, vermiculite, smectite, and quartz were identified through XRD. Kaolinite, illite, chlorite, and quartz were inherited from parent material. Vermiculite was formed from illite simple transformation due to cultivation and K depletion in soil surface near the River bank. Also, smectite was formed on the surface of this pedon. These clay types were not seen in subsurface of these soils. Illite and chlorite intensity decreased in surface soil which was related to transformation to vermiculite and smectite. In spite of first pedon, the clay mineral was identified in subsurface soil. This clay mineral was the result of high pH, salinity, and Mg concentration in ground water. More study showed that this smectite is trioctahedral.

**Keywords:** Alluvial plain, Khuzestan, Mineralogy, Soil development

---

\* Corresponding author: siroosjafari@yahoo.com

## **Influence of Irrigation Management and Drip Irrigation Laterals on Water Use, Yield and Net Benefits in Greenhouse Cucumber Production**

**RASSOUL ASADI<sup>1</sup> AND FATEME KARANDISH<sup>2\*</sup>**

1. Ph.D. Candidate, Student in Water Resources Engineering Zabol University
  2. Assistant Professor in the Department of Water Engineering Zabol University
- (Received: Dec. 23, 2014- Accepted: Dec. 26, 2015)

### **ABSTRACT**

The present research was carried out within the two growing seasons of 2010 and 2011 in Jiroft City, aimed at investigating the effect of different irrigation water levels as well as the pattern of drip irrigation system on the production of greenhouse cucumber. The research was carried on as a split-split-plot design of 16 treatments and three replications by combining the main vs sub-main factors. The main factor included four potential thresholds of 45 (I<sub>1</sub>), 55 (I<sub>2</sub>), 65 (I<sub>3</sub>) and 75 (I<sub>4</sub>) centibars for starting irrigation while the sub-main factors included four system patterns as surface (S<sub>1</sub>) or subsurface (S<sub>2</sub>) drip irrigation with either one lateral for each cropping row (L<sub>1</sub>) or alternate laterals (L<sub>2</sub>). In addition to determining water use and yield, the net return and final output rate was calculated as based on the partial budgeting method, using all ten determined costs and benefits. Results showed that the increase in the potential threshold for irrigation decreased the number of irrigation events and the volume of water use. The minimum (136.36) and maximum (269.11 Mg ha<sup>-1</sup>) yields were attributed to I<sub>4</sub>S<sub>1</sub>L<sub>2</sub> and I<sub>1</sub>S<sub>2</sub>L<sub>1</sub> treatments. Nevertheless, considering a decrease of 11.7% in the volume of water use as compared with I<sub>1</sub>S<sub>2</sub>L<sub>1</sub> treatment, I<sub>2</sub>S<sub>2</sub>L<sub>1</sub> treatment led to only one percentage reduction in yield bringing about the highest net income. Thus, considering the savings of water and the economic interest of farmers, applying this method for greenhouse production of cucumber in Jiroft would result in an increase in water use efficiency and as well in the final output rate.

**Keywords:** Economic analysis, Drip irrigation, Soil matric potential, Partial budgeting method, Jiroft.

---

\* Corresponding author: Karandish\_h@yahoo.com

## **A Comparative Evaluation of Nash vs Hybrid models, Parameter Estimation Methods to Model Rainfall-Runoff Process (Case Study: Alandchay Watershed)**

**JAVAD BEHMANESH<sup>1\*</sup>, NEDA KHANMOHAMMADI<sup>2</sup>, BABAK AMIATAEE<sup>3</sup>**

1. Associate professor, Water Engineering Department, Urmia University

2. Postgraduate, Water Resources Engineering, Urmia University

3. Postgraduate, water Resources Engineering, Urmia University

(Received: Apr. 5, 2014- Accepted: Dec. 26, 2015)

### **ABSTRACT**

Rainfall-runoff hydrological models have been recognized as indispensable essential tools for water resources management throughout the world. In this respect, Nash and Hybrid models have been developed as rainfall-runoff models in recent years. Within the present research, the different methods were evaluated to estimate the mentioned models, parameters in Alandchay watershed in West Azarbayjan and with the models being compared with each other. To follow the purpose, Hybrid model parameter within the base of empirical method and Nash model parameters (using eight different methods) were estimated. To evaluate the capability of the two mentioned models, such statistical indices as RMSE,  $R^2$  and MAE were employed. The least error bearing indices and the high values of determination coefficient indicated the potential of the two models for modeling the flood hydrographs. A comparison of the statistical indices, values and calculated errors showed that Nash model benefited from a better performance than the Hybrid model. The mean error of peak discharge for Nash and Hybrid models were obtained 5.99 and 12.07 m<sup>3</sup>/s and while the mean error of flood hydrograph peak time for the mentioned models were recorded as 0 and 3 hours, respectively.

**Keywords:** Alandchay watershed, Hybrid model, Nash model, Rainfall-runoff process, Unit hydrograph.

---

\* Corresponding author: j.vehmanesh@uumia.ac.ir

## **An Investigation of the Root System of Riparian Tamarix Tree, along the flow Direction of River to be utilized in Practical Slope Stabilization**

**ALIREZA HOSEINI<sup>1\*</sup>, MAHMOOD SHAF AEI BAJESTAN<sup>2</sup>**

1. Scientific Member, Water Engineering Department, University of Ilam

2. Professor, Faculty of Water Engineering, Shahid-Chamran University of Ahvaz

(Received: Jun. 25, 2015- Accepted: Dec. 26, 2015)

### **ABSTRACT**

Root system is one of the factors affecting soil shear strength, increasing it, and thus bringing about slope stability. This study investigates the root system of Tamarix trees on slope of riverbanks and in the direction of their flow. A number of five trees (from TAMARIX species) grown on the river bank were selected each within a distance of about one km from SAIMEREH River in Ilam Province. Circle profile trenching method was employed to obtain and study the root characteristics. In the direct on of flow, the number and diameter of roots were recorded on up and downside region of the plants. Results show that the number of roots on the upside region is about 11.6 percent more than those on the downside region. For all diameters, the number of roots in up region is more than those on the downside region. The average root diameter on the upside region is higher than that on the downside region. Total root area on the upper region is about 23 percent more than that in down region. On up region, thick roots contain more of total root but on down region it is the inverse. It is observed that, in direct flow, root system of riparian trees on riverbank is asymmetrical.

**Keywords:** Soil bioengineering, River engineering, Soil shear strength, Protection Riverbank, SAIMEREH River.

---

\* Corresponding author: ar.hoseini@ilam.ac.ir

## **An Investigation of the Impact of Macroalgal Mats on Sediments Action Process in Unidirectional and Wave-induced Flows**

**MOHAMMAD HEMMATI<sup>1\*</sup>, HOJJAT AHMADI<sup>2</sup>**

1. Assistant professor, water engineering Dep., Urmia University, Iran

2. Assistant professor, water engineering Dep., Urmia University, Iran

(Received: Dec.17, 2014- Accepted: Dec.1, 2015)

### **ABSTRACT**

The impact of macroalgal mats on sedimentation pattern was experimentally. Studied To achieve this object, a series of experiments were conducted in a large flume for different flow conditions and bed covers. The Power Spectral Density (PSD) method was employed to separate wave-induced velocities from turbulence. The results showed that the separation of wave-induced orbital velocity from turbulence is possible through the Power Spectral Density (PSD) method. The sedimentation results revealed that the bed level variations in bare bed were severer than in an algal bed, so that, the range of variations in bare bed was three times that of algal bed, especially in wavy flow conditions. In addition, the average number of ripple crests per meter decreased and the relative ripple wave length increased with an increase in flow discharge. Also the bedload quantity in the presence of algae decreased by 80% in unidirectional flow (current) while by 15% in wave-induced flow (a combination of wave and current) conditions.

**Keywords:** Macroalgal mat, Sediment pattern, Wave-induced flow, unidirectional flow, PSD method

---

\* Corresponding author: mhemmati1982@yahoo.com

## Evaluation of Estimation Methods for Water Field Capacity in Soils, Khuzestan Province

OMID SHEIKHESMAEILI<sup>1\*</sup>, HADI MOAZED<sup>2</sup>, ABD ALI NASERI<sup>3</sup>

1. Ph.D. candidate of Water Science Engineering Faculty, Shahid Chamran University of Ahvaz

2. Professor, Water Science Engineering Faculty, Shahid Chamran University of Ahvaz.

(Received: Jun. 3, 2015 - Accepted: Oct. 19, 2015)

### ABSTRACT

Indirect prediction of hydraulic characteristics of vadose zone is based on their readily available properties in the form of Pedo Transfer functions (PTFs), as a fast and low-cost solution has been widely practiced in irrigation and drainage problems. These studies was aimed at assessing the performance of the conventional methods of estimating soil moisture content at their field capacity ( $\theta_{fc}$ ) and introduce the appropriate PTF under laboratory and field conditions in Khuzestan province soils. The buried probes of the Time Domain Reflectometry device (TDR) were inserted at various depths to monitor soil moisture conditions in either of the physical model or experimental field under surface-point source drip irrigation with a discharge rate of 4 lph. Then, the physical soil properties and soil water contents at their specific matric potentials were assessed to determine the hydraulic parameters of Van Genuchten- Mualem (1980) model Throughwith the RETC program. The results of the research to evaluate the performance of several well-known Point-PTFs indicated that the quasi-empirical models as based upon physical principles can be a proper alternative to traditional methods for estimating  $\theta_{fc}$  on the condition of having been tested on the field. So that, the PTF of Twarakavi et al. (2009) with indices of NRMSE (3.1%) and SE (0.51%) could closely predict  $\theta_{fc}$  more accurately than either the Rosetta (2001) artificial neural network approach which presented the values of NRMSE (5.2%) and SE (0.71%), or the Dexter (2004) equation with the values of NRMSE (9.7%) and SE (1.75%). However, there were no differences observed in the indicator of Model Efficiency (ME) for each of the three PTFs. Based on the assessment results of these PTFs, the negative effects of soil compaction and the level of sand on the  $\theta_{fc}$  were clearly shown using one-way ANOVA ( $p < 0.05$ ). On the contrary, the levels of clay and silt exerted positive significant ( $p < 0.05$ ) increasing effects on  $\theta_{fc}$ .

**Keywords:** Pedotransfer Function, Quasi-Empirical Model, Soil Moisture Curve

---

\* Corresponding author: [omid.sheikh@hotmail.com](mailto:omid.sheikh@hotmail.com)

## Investigating the Effects of Environmental as well as Hydraulic Factors on Phosphorus Removal from Agricultural Waste Water through limestone

FERESHTEH ZADJANALI CHOUBARI<sup>1</sup>, MARYAM NAVABIAN<sup>2\*</sup>, MAJID VAZIFE DOUST<sup>3</sup>,  
MEHDI ESMAEILI VARAKI<sup>4</sup>

1. Graduate Student, Department of Water Engineering, Faculty of Agricultural Sciences, University of Guilan,
2. Assistant Professor, Department of Water Engineering, Faculty of Agricultural Sciences, University of Guilan
3. Assistant Professor, Department of Water Engineering, Faculty of Agricultural Sciences, University of Guilan
4. Assistant Professor, Department of Water Engineering, Faculty of Agricultural Sciences, University of Guilan

(Received: Aug.13, 2014- Accepted: Oct. 14, 2015)

### ABSTRACT

With regard to the increase in population rate and the acute water shortages within recent years, reuse of agricultural waste water has been considered as an approach to the solution. Phosphorus is one of the pollutants of the agricultural waste water, the too excess amount of which causes the degradation of aquatic ecosystems, reducing the quality of water resources and eutrophication.. In the present study, the trend of phosphorus removal through limestone and the effect of some such factors as particle size, temperature, and pH on phosphorus removal as well as the effect of hydraulics of flow on the adsorption isotherm were studied. In this respect, the absorption kinetics experiments on limestone mining Langmuir and Freundlich adsorption isotherm equation as based upon laboratory scale and physical model of drain channel were performed at the University of Guilan in dimensions of 15×15×200 cm to investigate the effect of hydraulic flow drainage in two rates (0.05-0.1 Lit/s) on the adsorption isotherm. Kinetic experiments indicated that the rate of phosphorus removal through limestone was fixed after 30 hours. Between two size-ranges of limestone (0.5-1 and 3-5 mm), there was no significant difference observed in the percentage of phosphorus removal. The changes of pH showed that rate of phosphorus removal decreases in pH ranging from 2 to 6 while it increased in the pH range from 6 to 11. The optimal pH for phosphorus removal through limestone was obtained in alkaline conditions. Increasing the temperature from 22 to 30°C was followed by a downward trend of phosphorus removal. With regard to isotherm experiments, the Freundlich equation, as through limestone, showed close agreement. Within the physical model of the drainage canal, lower flow rates; showed better results regarding the extent of phosphorus elimination. A statistical comparison of adsorption isotherm (under controlled conditions in laboratory) and the physical model of drainage canal, the experimental results showed a statistically significant level of phosphorus removal and while not being fully satisfied with this result when planning for the design of phosphorus removal basins .

**Keywords:** Isotherm, Orthophosphate, pH , Temperature.

---

\* Corresponding author: Navabian@Guilan.ac.ir

## Presenting a Simple Equation to Determine the Reference Evapotranspiration using NOAA Satellite Data

SEYED ABDOLLAH ALAVI<sup>1\*</sup>, ALI RAHIMIKHOOB<sup>2</sup>

1. Former Graduate Student, Irrigation and Drainage Engineering Department, Aburaihan Campus, University of Tehran

2. Professor, Irrigation and Drainage Engineering Department, Aburaihan Campus, University of Tehran

(Received: March. 7, 2015 - Accepted: Oct. 12, 2015)

### ABSTRACT

Accurate estimation of reference evapotranspiration ( $ET_0$ ) is needed for water resources management, farm irrigation scheduling, and environmental assessment. A large number of methods have been developed for assessing  $ET_0$  from meteorological data. However, most weather stations around the globe are located in nonagricultural settlements of dry, bare soil surface and/or concrete surfaces. Using these weather data may cause serious errors. Satellite images on the other hand cover large cultivated areas and fields. Throughout the present study, Penman–Monteith equation was converted to a simple equation of three components for each component of which there was a linear regression presented with satellite input data. To create and test regression equations, 297 NOAA-AVHRR satellite images for duration of ten years were acquired. The present investigation has been carried out in Amirkabir irrigated unit in Khuzestan province. The results indicate that the simplified equation can estimate  $ET_0$  with an  $R^2$  of 0.92 and an error of 8 percent.

**Keywords:** Amirkabir Irrigated Network, Penman–Monteith equation, Regression model, SAS software

---

\* Corresponding author: akhob@ut.ac.ir



## Runoff and Soil Loss as Affected by Land Use Change and as Well by Plugging Direction in Poorly Vegetation Covered Pastures

EHSAN ZARRINABADI<sup>1\*</sup>, ALIREZA VAEZI<sup>2</sup>

1. Former Graduate. Student, Dept. of Soil Science, University of Zanjan

2. Associate Prof., Soil Science, University of Zanjan

(Received: Apr. 15, 2015- Accepted: Oct.11, 2015)

### ABSTRACT

The effects of land use change and ploughing method on soil erosion in pastures have been widely known, nevertheless, there is not sufficient information regarding these human activities in semi-arid regions, particularly in Iran. Therefore, this study was conducted to investigate the effect of land use change as well as ploughing method on surface runoff, soil loss and crop yield in poorly vegetated pastures, in a semi-arid region of NW Iran, in 2014. Four scantily covered pastures of 12.6, 15.37, 17 and 19.4% slope steepness as were considered in the area with six plots (3m×10m) established in each, early autumn 2013. The plots consisted of pasture vegetation cover, rain fed wheat cultivation on the up to down slope, as well as rain fed wheat cultivation on the contours. A total of 24 plots were investigated using a completely randomized block design of at two replicates. Runoff and soil loss were recorded at the plots under natural rainfall events during on 8 month growth period. Soil loss was also measured at the plot outlets after each natural rainfall event causing runoff the study period. Significant differences were found between the cultivated plots and pasture plots in runoff and soil loss ( $p < 0.01$ ). Runoff and soil loss in the cultivated lands appeared to be 13 and 60 times bigger than the lands under pasture the two variables for the (up to down slope) cultivated plots were about 5.5 and 35 times greater than the contour cultivated plots. There existed a significant relationship between the slope and runoff generation ( $R^2 = 0.978$ ,  $p < 0.05$ ), and soil loss ( $R^2 = 0.998$ ,  $p < 0.01$ ) in the study slopes. The study revealed that the change of pastures to arable lands and ploughing up to down slope in semi-arid regions leads to accelerate on of runoff and soil loss, particularly in the lands of high slope steepness.

**Keywords:** Natural rainfall, Plough on the contours, Plough up and down slope, Experimental plot, Rain-fed wheat

---

\* Corresponding author: ehsan.zarrinabadi@gmail.com

## A Determination of the Relationship between Saturated Hydraulic Conductivity and Effective Porosity under Shallow Saline Water Table Management

PARVANEH TISHEHZAN<sup>1\*</sup>, ABDALI NASERI<sup>2</sup>, ZAHRA IZADPANA<sup>3</sup>, HOSSEIN AZIZNASAB<sup>4</sup>

1. Assistant Professor, Water Science and Engineering Faculty, Shahid Chamran University of Ahwaz.

2. Professor, Water Science and Engineering Faculty, Shahid Chamran University of Ahwaz.

3. Assistant Professor, Water Science and Engineering Faculty, Shahid Chamran University of Ahwaz.

4. Graduate Student Irrigation and Drainage, of Water Science and Engineering Faculty, Shahid Chamran university of Ahwaz

(Received: Jun. 2, 2015 - Accepted: Oct. 10, 2015)

### ABSTRACT

One of the ways to deal with water crisis is the use of unconventional, such as subsurface brackish water mixed with a proper crop management. The use of such water may affect the saturated hydraulic conductivity. A direct measurement of saturated hydraulic conductivity requires the expenditure of a lot of time and money. A lysimeter experiment was conducted to investigate the effect of water table salinity and depth management on saturated hydraulic conductivity and effective porosity and as well, to determine the relationship among them. The statistical design was a split-split plot arrangement of a randomized complete block design of three replicates for each treatment. Treatments included 3 levels of groundwater salinity (main plot; S1=<4, S2=8 and S3=12 dS/m) and 2 levels of water table depths (sub plot; D1=60 and D2=90 cm) and 2 levels of soil surface cover as sub plots (M1= no mulch and M2= date palm leaves mulch). Prior to the start of the experiments and as well 15 months past of the treatments, saturated hydraulic conductivity as well as effective porosity were recorded. The treatments indicated no effect on these parameters at 5% level. But mulch treated samples led to a decrease of soil salinity increasing seedling growth as well as root volume. As a result, these treatments showed to increase the saturated hydraulic conductivity. The relationship between saturated hydraulic conductivity and effective porosity was investigated using regression analysis. The best fit between  $\ln(K_s)$  and  $\phi_e$  values was concluded by a sigmoidal function ( $R^2=0.73$ ).

**Keywords:** Soil characteristics, Date palm, Water table, Crop management.

---

\* Corresponding author: partishehzan@scu.ac.ir

## Lead Biosorption Using Shrimp Shell: Kinetics, Isotherms and pH-Dependent Adsorption

NAHID HOSSEINI<sup>1</sup>, MOHSEN HAMIDPOUR<sup>2\*</sup>, VAHID MOZAFFARI<sup>3</sup>

1. Graduate Student, Soil Science, Vali-e-Asr University of Rafsanjan

2. Associate Prof., Vali-e-Asr University of Rafsanjan

3. Associate Prof., Vali-e-Asr University of Rafsanjan

(Received: Apr. 18, 2015 - Accepted: Sep. 29, 2015)

### ABSTRACT

The adsorption of lead (Pb) ions from an aqueous solution onto shrimp shell was evaluated in the present study. Several such important parameters influencing the adsorption of Pb (II) ions as initial pH, equilibrium time as well as different initial concentrations of Pb (II) ions was evaluated. The results indicated that the pseudo-second-order kinetic model could describe the kinetics of Pb adsorption by the adsorbent. With increase in Pb concentration from 100 to 1000 mgL<sup>-1</sup>, the level of Pb adsorbed by shrimp shell increased from 9 mg g<sup>-1</sup> to 90.2 mg g<sup>-1</sup>. Increasing suspension pH from 4 to 7 enhanced the adsorption of Pb. Further increase in pH from 7 to 10 resulted in decrease in the adsorption of the metal ion. The average adsorption of Pb by the adsorbent at pHs 6 and 7 exceeded 95 percent. The Sips and Freundlich models well described the adsorption of Pb isotherms, data. Infrared spectrum analysis of adsorbent (prior to, and after adsorption of Pb) showed that the N atoms of the amine functional groups played a major role in shrimp shell for the adsorption of Pb.

**Keywords:** Water and wastewater, Isotherms, Kinetic, Surface adsorption

---

\* Corresponding author: Mohsen\_hamidpour@yahoo.com

## Statistical and Experimental Assessment of a Clayey Soil Treated by Chemical Stabilization

AMIN GHASSEMI<sup>1\*</sup>, AMIN SOLTANI<sup>2</sup>, ALI RAEISI ESTABRAGH<sup>3</sup>, MOHAMMAD HOSSEIN OMID<sup>4</sup>

1. M.Sc. Student, Irrigation and Reclamation Eng. Dept., University of Tehran
  2. M.Sc. Student, Irrigation and Reclamation Eng. Dept., University of Tehran
  3. Associate Prof., Irrigation and Reclamation Eng. Dept., University of Tehran
  4. Professor, Irrigation and Reclamation Eng. Dept., University of
- (Accepted: Nov. 29, 2014 - Received: Sep. 29, 2015)

### ABSTRACT

This paper presents the results of an experimental program developed to investigate the effect of an additive agent branded CBRPLUS on the mechanical behavior of a forest soil with high plasticity. Various experiments consisting of Atterberg limits, standard compaction, California bearing ratio (CBR), swelling potential and swelling pressure were conducted on natural soil and soil stabilized with various percentages of CBRPLUS. The results indicated that the addition of this material (at the rate of 0.05%), significantly changes the physical and mechanical properties of rehabilitated soil, including, reduction of the liquid limit (at least 6%), plasticity index (at least 9%), swelling potential (at least 27%), and swelling pressure (at least 45%), and also increasing the bearing capacity of soil (at least 53%); hence, the improvement of soil properties is a function of mass percentage of CBRPLUS. Furthermore multiple regression models were developed for CBR, swelling potential and swelling pressure as a function of additive agent percentage, plasticity index and maximum dry unit weight with accuracy and a high degree of agreement between experimental and predicted values. In addition a sensitivity analysis was also performed to investigate the effect of various parameters on CBR, swelling potential and swelling pressure values.

**Keywords:** Soil stabilization, Bearing capacity, Swelling potential, Swelling pressure, Regression models

---

\* Corresponding author: amin\_ghassemi@ut.ac.ir

## **Presentation of Analytical Solution of Confined Seepage through Alluvial Foundations and their Evaluation**

**AHMADREZA MOHSENIAN<sup>1\*</sup>, MOHAMMAD SEDGHI ASL<sup>2</sup>, MANSOOR PARVIZI<sup>3</sup>**

1. Senior Expert, Islamic Azad University of Yasooj

2. Assistant Professor, Department of Soil Sciences, University of Yasooj

3. Assistant Professor, University of Yasooj

(Received: Apr. 20, 2015 - Accepted: Sep. 21, 2015)

### **Abstract**

Many analytical methods proposed for solving two-dimensional problems of groundwater are concerned with functions which transform the problem from a geometric status, where solution must be found, to another status in which the solutions are known. Conformal mapping and its appropriate techniques allow us to change complex flow problems into regular geometric shapes. Throughout the present paper, an analytical solution is provided for estimating uplift pressure in alluvial foundations below dams. In the present study, velocity Hodograph and Schwartz -Christoffel integrals are employed to determine the uplift pressure in alluvial foundations within different depths and sizes of sheet pile and upstream blanket. An important point in this study is the asymmetric insertion of blanket relative to sheet pile along the longitudinal path. Finally, the results obtained through this method us the ones of laboratory methods were compared to assess the accuracy of analytical results and to critically discuss the strengths vs weaknesses. The results indicate that in some cases new analytical method underestimates uplift pressure while in some circumstances there exists a good agreement between the two.

**Keywords:** Seepage, Uplift pressure, Alluvial foundation, Schwartz – Christoffel integral

---

\* Corresponding author: Ahmadreza.Mohsenian@yahoo.com

## **Effects of the Amount of Water (Tape Tube Irrigation) on Qualitative and Quantitative Yield of Three Sesame Varieties**

**NADER SALAMATI<sup>1\*</sup>, AMIRKHOSRO PANAI<sup>2</sup>**

1. Researcher, Behbahan Agricultural Research Station

2. Researcher and Faculty Member, Behbahan Agricultural Research Station

(Received: Jul, 26. 2014- Accepted: Sep, 21.2015)

### **ABSTRACT**

The present study was performed to investigate the effect of different levels of irrigation water applied in tape drip irrigation on yield, seed yield components, oil yield, percentage seed oil content, and seed water use efficiency for three sesame varieties in Behbahan Agriculture Research Station within the two years 2011 and 2012. The experiment was performed in split plots within the framework of a randomized complete block design of 3 replications. The main factor consisted of the different levels of irrigation water (50%, 75%, 100% and 125% water requirement) in tape drip irrigation and while sub factors consisting of three sesame varieties, namely Syntetik, Yellow white as well as Behbahan local variety. The results indicated that the effects of different levels of irrigation of water on seed yield and its components, and as well on the seed water use efficiency were statistically significant at 1% level. The effect of canola variety on seed yield, thousand seed weight, and number of capsules per plant and seed water use efficiency was also significant at 1% level, the best variety being Behbahan local one. The highest seed yields were obtained for the treatments 125% (1341 Kg/ha) and 100% water requirements (1345 Kg/ha), respectively. However the treatment 100% water requirement was the more appropriate treatment, as it consumed less water. The water use efficiency for the best treatment (Behbahan local variety with 75% of water requirement) was estimated as 0.135 Kg/m<sup>3</sup>.

**Keywords:** Tape Drip Irrigation, Quantitative properties, Water Use Efficiency

---

\* Corresponding author: nadersalamati@yahoo.com

## Comparing Groundwater Recharge in Sprinkler vs. Furrow Irrigated Farms Using Unsaturated Zone Modeling

ELHAM BEIKZADEH<sup>1\*</sup>, ALI NAGHI ZIAEI<sup>2</sup>, HOSEIN ANSARI<sup>3</sup>, RAZIEH LAK<sup>4</sup>, MOHSEN ZAKI<sup>5</sup>

1. Senior Expert, Faculty of Agriculture, Ferdowsi University of Mashhad
  2. Assistant Professor, Faculty of Agriculture, Ferdowsi University of Mashhad
  3. Associate Professor, Faculty of Agriculture, Ferdowsi University of Mashhad
  4. Senior Expert, Faculty of Agriculture, Ferdowsi University of Mashhad
  5. Ph. D. Student, Faculty of Agriculture, Ferdowsi University of Mashhad
- (Received: Feb. 28.2015- Accepted: Sep, 19.2015)

### ABSTRACT

For sustainable use as well as vulnerability assessment of aquifers, an estimation of the groundwater recharge is indispensable. In Iran, located in a semi-arid region, the groundwater recharge is closely related to and dependent on the return flow from irrigation. Therefore, an assessment of the proportion of the return flow, as recharge, from different irrigation methods is essential for better understanding and management of groundwater resources. Throughout the present study in Neyshabour watershed, the level of groundwater resulted from two different irrigation methods (furrow and sprinkler irrigation) were estimated using soil moisture measurement in two 6 meter depth wells on a wheat farm. In each well, REC sensors were installed within 0.5 meter intervals and two sensors installed at 0.15 and 0.3 m depths. Through the sensors, the soil moisture was daily measured for duration of 173 days. The collected data were used to simulate the unsaturated flow within these points using the 1D HYDRUS package. The model in each point was calibrated and implemented to estimate the drainage level underneath the 6 meter depth of soil layer. The application level of irrigation water, in furrow irrigation, was about 230 mm while it was 299 mm for sprinkler type of irrigation. The drainage level from 6 meter soil layer during the 173 days, in for furrow irrigation was 80 mm while in the sprinkle case it was negligible.

**Keywords:** Furrow irrigation, Sprinkle irrigation, Groundwater recharge, Unsaturated zone, Hydrus-1D

---

\* Corresponding author: Elhambz@gmail.com

## Physicochemical and Mineralogical Characteristics of Dust Particles Carried through Dust Storms in Ahvaz City

BEHNAZ KARIMIAN<sup>1</sup>, AHMAD LANDI<sup>2</sup>, SAEID HOJATI<sup>3\*</sup>, JAVAD AHADIAN<sup>4</sup>

1. Former Graduate. Student, Department of Soil Science, College of Agriculture, Shahid Cahmran University of Ahvaz

2. Associate Professor, Department of Soil Science, College of Agriculture, Shahid Cahmran University of Ahvaz

3. Assistant Professor, Department of Soil Science, College of Agriculture, Shahid Cahmran University of Ahvaz

4. Professor, College of Water Sciences, Shahid Cahmran University of Ahvaz

(Received: Apr, 25, 2015 – Accepted: Sep, 19, 2015)

### ABSTRACT

More than two thirds of the total area in Iran has been covered by arid and semi-arid regions and climate. Although dust storm is an important environmental issue in these regions, especially in western and southwestern provinces, limited information is available regarding characteristics and sources of such phenomena. This study was carried out to identify deposition rate, particle size distribution, heavy metal (Zn, Pb, and Cd) concentrations, and mineralogical composition of dust particles collected using marble dust collector (MDCO) from 15 sampling points in Ahvaz city during a 6 month period in 2011. Results indicated that the average level of deposited particles within the dust storm periods was considerably more pronounced than that of the period's with no dust storms. The results illustrated that, due to such local factors as the presence of bare lands surrounding the city, and abandoned constructional projects, dust deposition rate in such areas was far more than in other localities. Results also indicated the mineralogical composition of the dust particles mainly comprised of calcite, quartz, and feldspars. Results of particle size distribution analysis showed that the dust particles were mainly silt-sized. However, with occurrence of dust storms, the size of particles became tinier. The highest concentrations of the heavy metals Pb, Cd and Zn were observed downtown and in the industrial neighborhood of the city. In addition, the greatest concentration of the heavy metals was observed in December as compared with the other months of the study period.

**Keywords:** Ahvaz, Dust, Heavy Metals, MDCO, Silt.

---

\* Corresponding author: s.hojati@scu.ac.ir



## Spatial Prediction of Wheat Crop Yield Using Digital Soil Mapping in Gotvand, Khuzestan Province

ROHOLLAH TAGHIZADEH-MEHRJARDI<sup>1\*</sup>, SEYED ALIREZA SEYED JALALI<sup>2</sup>,  
FEREYDOON SARMADIAN<sup>3</sup>

1. Assistant Professor, Faculty of Agriculture and Natural Resources, University of Ardakan,  
Ardakan, Iran.

2. Assistant Professor, Soil and Water Research Institute, Karaj, Iran.

3. Professor, Department of Soil Science Engineering, Faculty of Agricultural Engineering and  
Technology, College of Agriculture and Natural Resources, University of Tehran, Karaj, Iran.

(Received: March. 8. 2015 – Accepted: Sep. 14, 2015)

### ABSTRACT

A number of 110 observed crop yields were correlated with auxiliary variables (DEM and Landsat images) using genetic programming (GP) in Gotvand area (Khuzestan Province). The spatial prediction map of wheat crop yield was prepared using the obtained equation. Wrapper algorithm identified some more important auxiliary variables Nof: DVI, SAVI, and wetness index and channel network based level. RMSE, coefficient of determination and Lin's concordance coefficient of GP (1) with all the auxiliary data were obtained as 525.11, 0.87 and 0.82, respectively. Moreover, results indicated GP (2) with auxiliary data selected through wrapper algorithm could also reasonably predict wheat crop yield (RMSE, coefficient of determination and Lin's concordance coefficient, 530.82, 0.86 and 0.79, respectively). It can, therefore, be recommended to use the same approach to predict spatial distribution of crop yields in the future studies.

**Keywords:** Auxiliary variables, wrapper algorithm, genetic programming, spatial variation

---

\* Corresponding author: r\_taghizade@yahoo.com

## An Investigation of Some Factors Affecting the Stability of Zero Valent Iron Nanoparticles in Aqueous Environments

MAHMOOD FAZELI SANGANI<sup>1\*</sup>, ALI REZA ASTARAEI<sup>2</sup>, AMIR FOTOVVAT<sup>3</sup>, HOJJAT EMAMI<sup>4</sup>

1. PhD Candidate, Department of Soil Sciences, Faculty of Agriculture, Ferdowsi University of Mashhad.
2. Associate Professor, Department of Soil Sciences, Faculty of Agriculture, Ferdowsi University of Mashhad
3. Associate Professor, Department of Soil Sciences, Faculty of Agriculture, Ferdowsi University of Mashhad.
4. Associate Professor, Department of Soil Sciences, Faculty of Agriculture, Ferdowsi University of Mashhad

(Received: July. 5, 2015- Accepted: Sep. 14, 2015)

### ABSTRACT

Considering the high potential of zero-valent iron nanoparticles (NZVI) for removal of contaminants from surface and groundwater, it essential to investigate the factors affecting their stability in aquatic environments. Throughout the present study, the effects of surface coating and background solution characteristics including nanoparticle concentration, ionic strength, and electrolyte type and dissolved organic matter content on the stability of NZVI in aqueous suspensions were investigated. A number of four two-way factorial experiments, based on completely randomized design of three replications, were conducted to explore the effects of surface coating and each of four background solution characteristics on the stability of NZVI suspension. Initially, bare NZVI (B-NZVI) and Carboxymethyl cellulose coated NZVI (CMC-NZVI) were synthesized and characterized. Thereafter NZVI suspensions were prepared in distilled water and at different levels of the selected characteristics. The hydrodynamic diameter and zeta potential were then assessed in each of the prepared suspensions. Results indicated CMC-NZVI suspensions were more stable than B-NZVI in all tested solutions. Increase in nanoparticle concentration, ionic strength and cation valence of background solution, increased hydrodynamic diameter and while decreasing zeta potential of NZVI which lead to more aggregation of NZVI and less stability of the suspension. On the contrary, increase in dissolved organic matter content resulted in more stability of NZVI suspension. Results also revealed that there are significant interactions between nanoparticle type and solution characteristics; as B-NZVI is more affected by change in solution chemistry than CMC-NZVI.

**Keywords:** Zeta potential, Hydrodynamic diameter, Carboxymethylcellulose, Zero valent Iron nanoparticles

---

\* Corresponding author: mahmoodfazelisangani@gmail.com

## Regression Model for Prediction of the Compressive Strength in Resin Treated soil-cement

MAHMOOD BABALAR<sup>1\*</sup>, ALI RAEISI ESTABRAGH<sup>2</sup>, IMAN BEITOLLAH POOR<sup>3</sup>, AMIN SOLTANI<sup>4</sup>

1. Former Graduated Student, University College of Agriculture and Natural Resources, University of Tehran
  2. Associate Professor, University College of Agriculture and Natural Resources, University of Tehran
  3. Ph. D. Student, University College of Agriculture and Natural Resources, University of Tehran
  4. Senior Expert, University College of Agriculture and Natural Resources, University of Tehran
- (Received: Feb. 9, 2015 – Accepted: Sep. 13, 2015)

### ABSTRACT

The effect of resin on treatment of soil-cement was studied through experimental tests. Three kinds of commercial resins with different percentage weights were used within the study. Test samples were made of mixtures of soil with different percentage weights of cement (8 % and 12%) and mixing of soil-cement with different percentage contents of resin (5, 8 and 10%). Unconfined compression tests were conducted on the prepared samples at different curing times. Results indicated that adding resin to soil-cement causes increase in the strength of the mixture. In addition, an increase in the strength is a function of percent cement content, resin percentage, type of resin (viscosity of the resin) as well as curing time. A regression model was proposed as based on the experimental data for predicting the compressive strength. The regression model consisted of percentage content cement percent resin, kind of resin (resin viscosity) as well as curing time as variables. A comparison between the model predictions and the experimental results reveals that the proposed models can satisfactorily predict the compressive strength as regards soil-cement resin mixtures.

**Keywords:** Soil improvement, Soil-cement-resin, Compressive strength, Regression model

---

\* Corresponding author: Babalar@ut.ac.ir

## Effects of Different Agronomic and Forest Land Uses on Soil Enzyme Activity

FATEMEH SHEIKHLOO<sup>1</sup>, MIRHASSAN RASOULI-SADAGHIANI<sup>2\*</sup>

1. Graduate Student, Soil Science, Dept. of Soil Science, Faculty of Agriculture, Urmia University, Urmia

2. Associate Prof. Soil Science, Dept. of Soil Science, Faculty of Agriculture, Urmia University

(Received: Oct. 7, 2014 – Accepted: Aug.17, 2015)

### ABSTRACT

The effects of agronomic, orchard and forest land uses on soil enzymes, activities were evaluated in West Azarbaijan. About 75 soil surface samples were collected from the different studied land use area in which soil enzyme activities including Acid Phosphatase (ACP), Alkaline Phosphatase (ALP), urease and dehydrogenase were assessed employing substrate-reaction methods. Results revealed that ALP and ACP activities in the forest type land use (344.3 and 582.3  $\mu\text{g pNP/g.h}$ , respectively) amounted to higher than in orchard ones, followed by agronomic land uses. However, urease enzyme in agronomic type land use ( $84.4\mu\text{g NH}_4^+\text{-N/g.2h}$ ) showed higher activity uses which can be resulted from high urea application on the agronomic farms. Dehydrogenase activity in the forest ( $7.2 \mu\text{g TPF/g.24h}$ ) was significantly higher than that in the agronomic land use. Assessment of soil quality index (SQI) showed ACP and dehydrogenase, OC, pH, available phosphorous as MDS had the highest effect on the studied soils, quality among the evaluated properties. SQI in forest land use (1.92) was significantly higher than that in orchard (1.71) and agronomic (1.41) land uses. It is understood that land use exerts high effect on soil enzyme activity and typically in intact ecosystems (forest) soil enzyme activity is high which can be thought as related to sustainability of these ecosystems.

**Keywords:** Soil enzymes, Orchard, Forest, Agronomic land use.

---

\* Corresponding author: m.rsadaghiani@urmia.ac.ir